NAME: _____KEY_____

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Time: 75 minutes ONLY!

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I. (12%) Please circle the most appropriate answer for the following <u>4</u> multiple choice questions.

- Solve $_{n+4}P_2$:
  a. $(n+4)!/2!(n+2)!$
  b. $n+4$
  c. $n^2+12n+7$
  d. $(n+4)!/2!$
  (e.) $n^2+7n+12$

$$\frac{(n+1)(n+2)(n+3)(n+4)}{(n+2)(n+1)}$$

$$\frac{(n+4)!}{((n+4)-2)!}$$

$(n+3)(n+4)$
$n^2+4n+3n+12$
$n^2+7n+12$

- Solve $_{a+5}C_{a+2}$:
  a. $3!$
  b. $(a+5)/6$
  c. $(a+5)!/(a+2)!$
  d. $(a^3+5a^2+a+6)/6$
  (e.) None of the above (state your answer: $\frac{a^3+12a^2+47a+60}{6}$

Use the following information to answer the 2 subsequent questions:
A safety pin code consists of eight characters. The first three numbers are already set to be 357, the last two are supposed to be Latin letters (a-z).

- How many different pin codes are possible?
  a. 1,676
  b. 136,500
  c. 141,960
  (d.) 676,000 ∝
  e. 468,000

357

- How many different pin codes are possible considering that we can have neither the same number nor the same letter repeated in this safety code?
  a. 1,676
  (b.) 136,500 ∝
  c. 141,960
  d. 676,000
  e. 468,000

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3. The US Federal Aviation Administration reported that passenger revenues on international flights increased from $528 million in 1972 to $5,100 million in 1995. What is the geometric mean annual percent increase in international passenger revenues?

a. 10.36
b. 27.9
c. 103.6
d. 9.96
e. None of the above

4. Samples of wires coming off the production line were tested for tensile strength. The statistical results (in PSI) were:

Arithmetic mean	500	Median	500
Mode	500	Standard deviation	40
Mean deviation	32	Number in sample	100
Range	240	Interquartile range	25

According to the Empirical Rule, the middle 95 percent of the wires tested between approximately what two values?

a. 450 and 550
b. 460 and 540
c. 420 and 580
d. 380 and 620
e. None of the above

5. Suppose the following information is obtained from a set of data:
Smallest data value = 21
Largest data value = 94
10th percentile value = 24
25th percentile value = 34
50th percentile value = 53
75th percentile value = 68
90th percentile value = 82

Then, we can say that the range of the original data and the interquartile are _____ and _____ respectively.

a. 58 and 34
b. 34 and 58
c. 73 and 58
d. 73 and 34
e. None of the above

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III. (10%) The SAT scores of the applicants to a community college have a bell-shaped distribution with a mean of 900 and a standard deviation of 60. The admissions office, which bases acceptance solely on SAT scores, advertises an 84% acceptance rate. Cathy Henry is suing the college because she feels she should have been accepted with her SAT score of 780. Should Cathy's attorney hire a statistician to substantiate her case? That is, would a statistician find that she has been unjustly denied acceptance? If not , what would the acceptance rate have to be for Cathy to be accepted?

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Use the following information to answer the 3 subsequent questions:
Suppose that 10% of the students entering university do not graduate after 3 years. Six students are selected at random. We are interested in the probability that exactly one will graduate after 3 years.

☺ Solve the problem assuming that of 100 students, the sample was drawn without replacement.
- ☐ 0.3889
- ☐ 0.3189
- ☐ 0.3293
- ☐ 0.354

- ☐ 0.3687
- ☐ None of the above (state your answer:_____)

☺ Solve the problem assuming the sample was drawn with replacement.
- ☐ 0.3889
- ☐ 0.3189
- ☐ 0.3293
- ☐ 0.354

- ☐ 0.3687
- ☐ None of the above (state your answer:_____)

$$6C1 (\pi)^1 (0.9)^5$$

☺ Assuming replacement, solve the problem using Poisson distribution.
- ☐ 0.3889
- ☐ 0.3189
- ☐ 0.3293
- ☐ 0.354

- ☐ 0.3687
- ☐ None of the above (state your answer:_____)

☺ Each new employee is given an identification number. The personnel files are arranged sequentially starting with employee number 0001. To sample the employees, the number 0153 was first selected. Then, numbers 0253, 0353, 0453, and so on became members of the sample. This type of sampling is called:
- ☐ Simple random sampling
- ☐ Systematic sampling
- ☐ Stratified random sampling
- ☐ Cluster sampling

- ☐ Snowball sampling
- ☐ None of the above (state your answer:_____)

☺ Fine Furniture Products, Inc. produced 2,460 desks in 1993 and 6,520 in 2003. To find the average annual percent increase in production, which statistic should be used?
- ☐ Arithmetic Mean
- ☐ Median
- ☐ Mode
- ☐ Geometric Mean

- ☐ Interquartile range
- ☐ None of the above (state your answer:_____)

☺ A useful measure to compare the relative dispersion in two or more distributions, if they are in different units, is the
- ☐ Coefficient of skewness
- ☐ Coefficient of variation
- ☐ Coefficient of kurtosis
- ☐ range

- ☐ Interquartile range
- ☐ Standard deviation
- ☐ None of the above (state your answer:_____)

Use the following information to answer the 4 subsequent questions:
Suppose that of all undergraduates who begin a degree course in higher education 80% eventually get a degree.
If a random sample of 5 is selected, what is the probability that $n=5$

☺ None will graduate. $(x=0)$

□1

□0.32768

□0

□0.00032 $5 c 0 (0.8)^0 (0.2)^5$

□0.16

□None of the above (state your answer:_____)

☺ All five will graduate

□1

□0.32768 $P(x=5)$

□0

□0.00032

□0.16

□None of the above (state your answer:_____)

☺ At least one will graduate

□1

□0.99968 $P(x \geq 1)$

□0 $5 c 1 (0.8)^1 (0.2)^4$

□0.67232 $= 0.6664$
              $\Rightarrow 1 - 0.004 \Rightarrow 0.9996$

□0.84

□None of the above (state your answer:_____)

☺ At least four will graduate

□0.73728 $P(x \geq 4)$

□0.32768 $5 c 4 (0.8)^4 (0.2)^1$

□0.33408 $\Rightarrow 0.4$

□0.94208 $\Rightarrow 1 - 0.4$
              $\Rightarrow 0.6$

□0.16

□None of the above (state your answer: 0.6752)

Use the following information to answer the 3 subsequent questions:
Assume that breakdown in a certain electricity supply occur randomly with a mean of one breakdown every 10 weeks.
☺ What is the mean number of breakdowns per week?

□1 $M = 1.\pi$

□4 $1 = 10.\pi$

□5 $0.1 = \pi$

□6

□10

□None of the above (state your answer:_____)

☺ What is the probability of two breakdowns in a given week?

□0.0000495 $P(2) = \dfrac{u^x e^{-u}}{x!}$

□0.0099

□0.01 $= 0.0045$

□0.02

□0.2

□None of the above (state your answer:_____)

☺ What is the probability of more than 1 breakdown to occur in a given week?

□0.0047 $P(x>1)$

□0.045 $= 0.0047$

□0.0002

□0.9048

□0.01

□None of the above (state your answer:_____)

☺ **How is a Poisson distribution skewed?**

☒Positively $5\% \; \hat{s} \; +$ ☐The concept of skewness does
☐Negatively $95\% \; \hat{s} \; -$ not apply to a Poisson
☒Symmetrical   distribution
☐Uniform   ☐None of the above (state your
answer:_____)

Use the following information to answer the 2 subsequent questions:
In a multiple-choice test consisting of 20 questions, there are 5 possible answers
to each question only one of which is correct.
If a candidate randomly guesses all the answers;

☺ How many correct answers would you expect the candidate to obtain?

☒4 $\dfrac{1 \; correct}{5 \; possible \; answers} = 0.2 \times 2E$ ☐15
☐5 $= 4 \; correct$ ☐None of the above (state your
☒6   answer:_____)
☐10

☺ How many marks would you expect the candidate to be awarded in the test if 4
marks are given for a correct answer and 1 mark is deducted for an incorrect
answer?

☒(12)(0.93)   ☐0.4186
☐0.84   ☒None of the above (state your
☐0.5184   answer:_____)
☐2

Use the following information to answer the 3 subsequent questions:
A box of 20 fuses includes 5 fuses that do not operate. Six fuses are selected at
random from the box.

☺ What is the probability half of them will not operate properly?

☒0.2941 $\dfrac{5C3 , 15C3}{20 C 6}$ ☐0.1318
☒0.1174   ☐None of the above (state your
☐0.5   answer:(_____)
☐0.1

☺ What is the probability that 6 of them will not operate properly?

☐0.7748   ☐1
☐0.000244   ☒None of the above (state your
☐0.015625   answer:_____)
☐$_{20}C_6$

☺ What is the probability that at least two will not operate properly?

☐0.0726 $x=2 \quad x=3 \quad x=4 \quad x=5$ ☐0.9274
☐0.3661   ☐None of the above (state your
☒0.4835 $0.3520 + 0.1170 + 0.0135 + 0.0005$ answer:_____)
☐0.6339

Use the following information to answer the 5 subsequent questions:
One hundred students took their final exams in two courses Statistics and
Economics. The following table reflects their results.

		Statistics	
		Pass	Fail
Economics	Pass	(70)	10
	Fail	15	(5)

Eco, pass 80
Fail 20
Stat, pass 85
fail 15

Let A be the event "Pass in Economics."
Let B be the event "Pass in Statistics."

☺ Calculate P(A)
- ☐70%
- ☒80%
- ☐95%
- ☐75%
- ☐ 10%
- ☐None of the above (state your answer:_____)

☺ Calculate P(A∪B)
- ☐70/95
- ☐80%
- ☒95/100   *because out of some stupid step*
- ☐70/100
- ☐ 70/80
- ☐None of the above (state your answer:_____)

☺ Calculate P(B/A)
- ☐70/85   *Ans 82*
- ☐70%
- ☐15/100
- ☒10/100
- ☒70/80
- ☐None of the above (state your answer:_____)

☺ Calculate P(A/ B)
- ☒70/85   *B is 85*
- ☐70%
- ☒15/100
- ☐10/100
- ☐ 70/80
- ☐None of the above (state your answer:_____)

☺ Are A and B
- ☐Mutually exclusive and Statistically Independent.
- ☐ Not Mutually exclusive but Statistically Independent
- ☒Not Mutually exclusive and Not Statistically Independent
- ☐Mutually exclusive but Not Statistically Independent
- ☐ None of the above (state your answer:_____)

☺ Solve $_{n+5}P_3$
- ☐(n+5)(n+4)(n+3)(n+2)/6
- ☐ (n+5)(n+4)(n+3)(n+2)
- ☐(n+5)(n+4)(n+3)/6
- ☒(n+5)(n+4)(n+3)
- ☐(n+5)(n+4)
- ☐None of the above (state your answer:_____)

5. (40%) A university president has proposed that all students must take a course in ethics as a requirement for graduation. Three hundred faculty members and students from this university were asked about their opinion on this issue. The following table gives a two-way classification of the responses of these faculty members and students.

Members	Opinion			
	Favor	Oppose	Neutral	Γ
Faculty	45	15	10	70
Student	90	110	30	230
Γ	135	125	40	300

If you randomly selected a member of this university, what is the probability that he / she is:

    a. A student who is in favor of the issue?
    b. A member who either favored or was neutral to the issue?
    c. A faculty given the issue was opposed?
    d. A faculty member neither favoring nor opposing the issue?
    e. A member who favored and was neutral to the issue?

Do you think that (don't forget to tell me why?!!)

    f. Opposing and favoring the issue are complementary events?
    g. Student and favoring are independent events?
    h. Student and neutral are mutually exclusive?

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6. (10%) The customer service manager of Courier Express is responsible for expediting late mail delivery. From past experience, she knows that prompt deliveries occur 90% of the time and late deliveries occur 10% of the time. Determine the probability that in 4 deliveries:

    a. Three or fewer deliveries will be prompt.
    b. Less than two deliveries will be late.

G☺☺D Luck!!